

CLAIMS

What is claimed is:

- 5 1. In a beginning tunneling device, a method of communication comprising the steps of:
- detecting an initial request;
- identifying the initial request as a candidate to be a tunneling request;
- modifying at least one indicator of an initial header in the initial request
- 10 to convert the initial request into the tunneling request; and
- forwarding the tunneling request towards an end tunneling device.
- 15 2. The method of claim 1 wherein the step of identifying comprises the step of:
- detecting that a destination address in the initial request is for a destination device associated with an end tunneling device.
- 20 3. The method of claim 1 wherein the step of modifying comprises the step of:
- setting a protocol indicator in the initial header to a value indicating that the initial request is a tunneling request.
- 25 4. The method of claim 1 wherein the step of modifying comprises the step of:
- replacing a destination address of a destination device in the initial header with an end tunneling address of an end tunneling device to produce a tunneling header.
- 30 5. The method of claim 1 wherein the step of modifying comprises the step of:
- specifying a destination code within the tunneling header for at least one of a plurality of destination addresses of destination devices served by the end tunneling device.

6. The method of claim 5 wherein the initial request received by the beginning tunneling device is in the format of a TCP/IP protocol and wherein the step of specifying comprises the steps of:
 - generating a destination code to designate a destination address served by the end tunneling device; and
 - storing the destination code in a fragment offset field of an IP header of the tunneling request.
7. The method of claim 1 wherein the step of modifying comprises the step of:
 - setting an error correction code in the tunneling header to reflect modifications made to convert the initial header to the tunneling header.
8. The method of claim 1 wherein the initial request received by the beginning tunneling device is in the format of a TCP/IP protocol and wherein the step of modifying comprises the step of:
 - setting a protocol indicator in the initial header to a value indicating that the initial request is a tunneling request;
 - replacing a destination address in the initial header with an address of an end tunneling device; and
 - setting an error correction code in the tunneling header to reflect modifications made to the initial header.
9. The method of claim 1 wherein the initial request and the tunneling request are the same size.
10. The method of claim 9 wherein the initial and tunneling request include respective initial and tunneling headers of the same size.

11. The method of claim 1 wherein the initial request is a full initial request and wherein the full initial request can be fully converted into a single tunneling request.
- 5 12. In an end tunneling device, a method of communication comprising the steps of:
detecting a tunneling request;
identifying the tunneling request as a candidate to be an initial request;
modifying the at least one indicator of a tunneling header in the
tunneling request to convert the tunneling request into the initial request; and
10 forwarding the initial request towards a destination device.
13. The method of claim 12 wherein the step of modifying comprises the step of:
setting a protocol indicator obtained from the tunneling header to a value
to convert the tunneling request to an initial request.
- 15 14. The method of claim 12 wherein the step of modifying comprises the step of:
replacing an end tunneling address of the end tunneling device in the
tunneling header with a destination address to produce an initial header.
- 20 15. The method of claim 12 wherein the step of modifying comprises the step of:
obtaining a destination code within the tunneling header for at least one
of a plurality of destination addresses of destination devices served by the end
tunneling device; and wherein the destination address used in the step of
replacing is determined by the destination code.
- 25 16. The method of claim 15 wherein the tunneling request received by the end
tunneling device is in the format of a TCP/IP protocol and wherein the step of
obtaining comprises the steps of:
reading a destination code from a fragment offset field of an IP header of
30 the tunneling request; and

from the destination code, ascertaining the destination address served by the end tunneling device.

17. The method of claim 12 wherein the step of modifying comprises the step of:
5 setting an error correction code in the initial header to reflect
modifications made to convert the tunneling header to the initial header.
18. The method of claim 12 wherein the tunneling request received by the end
tunneling device is in the format of a TCP/IP protocol and wherein the step of
10 modifying comprises the steps of:
 setting a protocol indicator obtained from the tunneling header to a value
to convert the tunneling request to an initial request;
 replacing an address of the end tunneling device in the tunneling header
with destination address to produce an initial header; and
15 setting an error correction code in an initial header to reflect
modifications made to the tunneling header.
19. In a tunneling device, a method of performing tunneling communication
comprising the steps of:
20 detecting a first request;
 identifying the first request as being associated with a tunneling
operation;
 converting the first request to a second request for use in the tunneling
operation, wherein the first and second request are the same size; and
25 forwarding the second request towards a destination.
20. The method of claim 19 wherein the first and second request include respective
first and second headers of the same size.
- 30 21. A beginning tunneling device for processing initial requests comprising:

a memory;
a communications interface;
a processor; and
an interconnection mechanism coupling the memory, the processor and
5 the communications interface;

wherein the processor is configured to:

detect an initial request;

identify the initial request as a candidate to be a tunneling
request;

10 modify at least one indicator of an initial header in the
initial request to convert the initial request into the tunneling
request; and

forward the tunneling request towards an end tunneling
device.

15

22. The beginning tunneling device of 21 wherein, to identify the initial request, the
beginning tunneling device is configured to:

detect that a destination address in the initial request is for a destination
device associated with an end tunneling device.

20

23. The beginning tunneling device of claim 21 wherein, to modify at least one
indicator, the beginning tunneling device is configured to:

set a protocol indicator in the initial header to a value indicating that the
initial request is a tunneling request.

25

24. The beginning tunneling device of claim 21 wherein, to modify at least one
indicator, the beginning tunneling device is configured to:

replace a destination address of a destination device in the initial header
with an end tunneling address of an end tunneling device to produce a tunneling
30 header.

25. The beginning tunneling device of claim 21 wherein, to modify at least one indicator, the beginning tunneling device is configured to:
- 5 specify a destination code within the tunneling header for at least one of a plurality of destination addresses of destination devices served by the end tunneling device.
26. The beginning tunneling device of claim 25 wherein the initial request received by the beginning tunneling device is in the format of a TCP/IP protocol and
- 10 wherein, to specify a destination code, the end tunneling device is further configured to:
- generate a destination code to designate a destination address served by the end tunneling device; and
- 15 store the destination code in a fragment offset field of an IP header of the tunneling request.
27. The beginning tunneling device of claim 21 wherein, to modify at least one indicator, the beginning tunneling device is configured to:
- 20 set an error correction code in the tunneling header to reflect modifications made to convert to the tunneling header the initial header.
28. The beginning tunneling device of claim 21 wherein the initial request received by the beginning tunneling device is in the format of a TCP/IP protocol and
- 25 wherein, to modify at least one indicator, the beginning tunneling device is configured to:
- set a protocol indicator in the initial header to a value indicating that the initial request is a tunneling request;
- replace a destination address in the initial header with an address of an end tunneling device; and

set an error correction code in the tunneling header to reflect modifications made to the initial header.

29. The beginning tunneling device of claim 21 wherein the initial request and the tunneling request are the same size.
30. The beginning tunneling device of claim 29 wherein the initial and tunneling request include respective initial and tunneling headers of the same size.
31. The beginning tunneling device of claim 21 wherein the initial request is a full initial request and wherein the full initial request can be fully converted into a single tunneling request.
32. A end tunneling device for processing tunneling requests comprising:
 - a memory;
 - a communications interface;
 - a processor; and
 - an interconnection mechanism coupling the memory, the processor and the communications interface;
 wherein the processor is configured to:
 - detect a tunneling request;
 - identify the tunneling request as a candidate to be an initial request;
 - modify the at least one indicator of a tunneling header in the tunneling request to convert the tunneling request into the initial request; and
 - forward the initial request towards a destination device.
33. The end tunneling device of claim 32 wherein, to modify the at least one indicator, the end tunneling device is configured to:

set a protocol indicator obtained from the tunneling header to a value to convert the tunneling request to an initial request.

34. The end tunneling device of claim 32 wherein, to modify the at least one
5 indicator, the end tunneling device is configured to:
replace an end tunneling address of the end tunneling device in the tunneling header with a destination address to produce an initial header.
35. The end tunneling device of claim 32 wherein, to modify the at least one
10 indicator, the end tunneling device, is configured to:
obtain a destination code within the tunneling header for at least one of a plurality of destination addresses of destination devices served by the end tunneling device; and wherein the destination address used in the step of replacing is determined by the destination code.
36. The end tunneling device of claim 35 wherein the tunneling request received by
15 the end tunneling device is in the format of a TCP/IP protocol and wherein, to obtain a destination code, the end tunneling device, is configured to:
read a destination code from a fragment offset field of an IP header of
20 the tunneling request; and
from the destination code, ascertain the destination address served by the end tunneling device.
37. The end tunneling device of claim 32 wherein, to modify the at least one
25 indicator, the end tunneling device is configured to:
set an error correction code in the initial header to reflect modifications made to convert the tunneling header to the initial header.

38. The end tunneling device of claim 32 wherein the tunneling request received by the end tunneling device is in the format of a TCP/IP protocol and wherein, to modify the at least one indicator, the end tunneling device is configured to:
- set a protocol indicator obtained from the tunneling header to a value to
 - 5 convert the tunneling request to an initial request;
 - replace an address of the end tunneling device in the tunneling header with destination address to produce an initial header; and
 - set an error correction code in an initial header to reflect modifications made to the tunneling header.
- 10
39. A tunneling device for processing tunneling requests comprising:
- a memory;
 - a communications interface;
 - a processor; and
 - 15 an interconnection mechanism coupling the memory, the processor and the communications interface;
- wherein the processor is configured to:
 - detect a first request;
 - identify the first request as being associated with a tunneling operation;
 - 20 convert the first request to a second request for use in the tunneling operation, wherein the first and second request are the same size; and
 - forward the second request towards a destination.
40. The tunneling device of claim 39 wherein the first and second request include
- 25 respective first and second headers of the same size.
41. A computer program product that includes a computer readable medium having instructions stored thereon for conducting communications such that the instructions, when carried out by the computer, cause the computer to perform
- 30 the steps of:

detecting an initial request;
identifying the initial request as a candidate to be a tunneling request;
modifying at least one indicator of an initial header in the initial request
to convert the initial request into the tunneling request; and
5 forwarding the tunneling request towards an end tunneling device.

42. A beginning tunneling device, for processing initial requests comprising:
- a memory;
 - a communications interface;
 - 10 a processor;
 - an interconnection mechanism coupling the memory, the processor and the communications interface;
 - means, coupled to the communications interface, for detecting an initial request;
 - 15 means, coupled to the communications interface, for identifying the initial request as a candidate to be a tunneling request;
 - means, coupled to the communications interface, for modifying at least one indicator of an initial header in the initial request to convert the initial request in to the tunneling request; and
 - 20 means coupled to the communications interface, for forwarding the tunneling request towards an end tunneling device.